

**Notice of Allowability**

Application No.

10/765,947

Applicant(s)

LATYPOV ET AL.

Examiner

William C. Choi

Art Unit

2873

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to interview conducted 9/30/2004.
2. ☒ The allowed claim(s) is/are 1-23.
3. ☒ The drawings filed on 29 January 2004 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

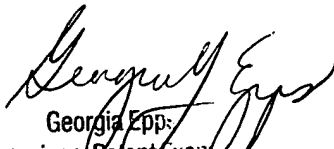
Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 0904.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
Georgia Epps  
Supervisory Patent Examiner  
Technology Center 3800  
Notice of Allowability

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with George Bardmesser on September 30, 2004.

The application has been amended as follows:

1. Claim 14, line 2, delete "-type".
2. Claim 15, line 2, delete "-type".
3. On page 13 of the specification, section [0060], line 2, delete "16 :m" and insert therein --16  $\mu\text{m}$ --.
4. On page 14 of the specification, section [0060], line 1, delete " $V = 0$  and  $V = V_0$ " and insert therein -- $\alpha = 0$  and  $\alpha = \alpha_0$ --.

## CLAIMS

14. The system of claim 1, wherein the spatial light modulator array is a pistoning spatial light modulator array.

15. The system of claim 1, wherein the spatial light modulator array is a tilting micromirror spatial light modulator array.

## SPECIFICATION

[0060] For the example illustrate in **FIGS. 6-8**,  $\lambda = 193.375$  nm,  $L$  (pixel dimension) = 16  $\mu$ m,  $NA$  (calibration PO) =  $10 * \lambda / L = 0.12$  (i.e., the calibration PO **110** captures up to the 10th diffraction order, which means it resolves the pixel **302** well), pixel **302** tilts between  $\alpha = 0$  and  $\alpha = \alpha_0 = \lambda / (2L)$  – the range of tilts to calibrate. **FIG. 7** illustrates the field in the pupil of the projection optics **110** for ten different tilt values for a single pixel (note that with this and subsequent related figures, modulation of only one pixel is illustrated for clarity, although the invention permits measurement of multiple pixels simultaneously). With a numerical aperture of 0.12 (a fairly large numerical aperture), the pixel **302** is well defined in the PO pupil field for all the tilt angles illustrated. However, as shown in **FIG. 8**, in the PO image plane, there is virtually no modulation of intensity for the entire angular range. In other words, with so many diffraction orders captured by the large numerical aperture projection optics **110**, modulation is not achieved, even though the pixel **302** is well resolved in the PO image plane.

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Allowed Claims: 1-23.

### **REASONS FOR ALLOWANCE**

The following is an examiner's statement of reasons for allowance: none of the prior art either alone or in combination disclose or teach of the claimed combination of limitations to warrant a rejection under 35 USC 102 or 103.

Specifically, with respect to independent claim 1, none of the prior art alone or in combination disclose or teach of a system for calibrating a spatial light modulator array comprising an illumination system and a spatial light modulator as claimed, specifically further comprising a projection optical system that images the spatial light modulator array onto an image plane, a shearing interferometer that creates an interference pattern in the image plane and a controller modulating elements of the spatial light modulator array.

Specifically, with respect to independent claim 17, none of the prior art alone or in combination disclose or teach of a method for calibrating a spatial light modulator array comprising modulating the light and passing it through a projection optical system to image the spatial light modulator array onto an image plane as claimed, specifically further comprising shearing the light to create an interference pattern in the image plane, detecting the light in the image plane to measure interference fringes and modulating the spatial light modulator array while repeating the detecting step.

### **CITATION OF RELEVANT PRIOR ART**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wegmann (U.S. 2003/0137655 A1), Mui (U.S. 6,674,519 B2), Brown et al (U.S. 6,057,913) and Salmon, Jr. (U.S. 5,042,950) are being cited herein to show systems comprising shearing interferometers, but do not specifically disclose a projection optical system that images the spatial light modulator array onto an image plane and the shearing interferometer creating an interference pattern also in the image plane.

### **CONCLUSION**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (571) 272-2324. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (571) 272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

W.C

William Choi  
Patent Examiner  
Art Unit 2873  
September 30, 2004

  
Georgia Epps  
Supervisory Patent Examiner  
Technology Center 2800